



# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		



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## 1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.

If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

## 2. General Information

### TFT

ITEM	STANDARD VALUES	UNITS
LCD type	4.3" TFT	--
Dot arrangement	480(RGB)×272	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmission / Normally White	-
Gray Scale Inversion Direction	6 O'clock	--
Eyes Viewing Direction	12 O'clock	
Driver IC	HX8257A	--
Module size	105.5(W)×67.2(H)×4.2(T)	mm
Active area	95.04(W)×53.86(H)	mm
Interface	24bit RGB	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	12 White LED	--
Weight	TBD	g

### CTP

ITEM	STANDARD VALUES	UNITS
CTP type	Cover Lens+sensor+FPC	--
CTP Driver IC	S3103	--
Surface Treatment	6H	--
Transmittance	≥86%	--
The cover hardness	6H	--
CTP size	105.1(W)×66.8(H)×1.63(T)	mm
CTP Active area	96.04(W)×54.86(H)	mm
CTP Interface	I2C	
response time	10	ms
Pointing Stick	5	



## 4. Interface Description

### TFT

PIN NO.	PIN NAME	DESCRIPTION
1	VLEDK	LED backlight (Cathode).
2	VLEDA	LED backlight (Anode).
3	GND	Ground for logic.
4	VDD	Power supply for voltage
5-12	R0-R7	Red Data.
13-20	G0-G7	Green Data.
21-28	B0-B7	Blue Data.
29	GND	Ground for logic.
30	CLK	Dot clock signal input. Latching input data at its rising edge.
31	DISP	Display on/off.
32	HSYNC	Horizontal sync input. Negative polarity.
33	VSYNC	Vertical sync input. Negative polarity.
34	DE	Data enable input. Active high to enable the input data bus.
35	NC	No connection
36	GND	Ground for logic.
37	NC(XR)	No connection /TP Right.
38	NC(YD)	No connection /TP Bottom.
39	NC(XL)	No connection /TP Left.
40	NC(YU)	No connection /TP Up.

NOET: 24-Bit: R2=00hm, R3=NC  
 8-bit: R3=00hm, R2=NC

### CTP

Pin	Symbol	Description.
1	SCL	CTP I2C_clock.
2	SDA	CTP I2C_data.
3	INT	CTP interruption signal.
4	GND	Power ground
5	VCC	Power supply.
6	RST	CTP reset pin. Active low to enter reset state.



## 5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Analog Supply Voltage	VDD	-0.3	4.0	V
CTP Supply Voltage	VCC	-0.3	4.0	V
Input Voltage	V <sub>in</sub>	-0.3	VDD+0.3	V
Operating Temperature	T <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Storage Humidity	HD	20	90	%RH

## 6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Analog Supply Voltage	VDD	2.5	2.8	3.6	V	-
CTP Supply Voltage	VCC	2.5	3.3	3.6	V	-
Input High Voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V	-
Input Low Voltage	V <sub>IL</sub>	GND	-	0.3 VDD	V	-
Output High Voltage	V <sub>OH</sub>	0.8 VDD	-	VDD	V	-
Output Low Voltage	V <sub>OL</sub>	GND	-	0.2 VDD	V	-
I/O Leak Current	I <sub>LI</sub>	-1	-	1	uA	-
Supply Current	IDD	-	TBD	-	mA	-

## 7. Timing Characteristics

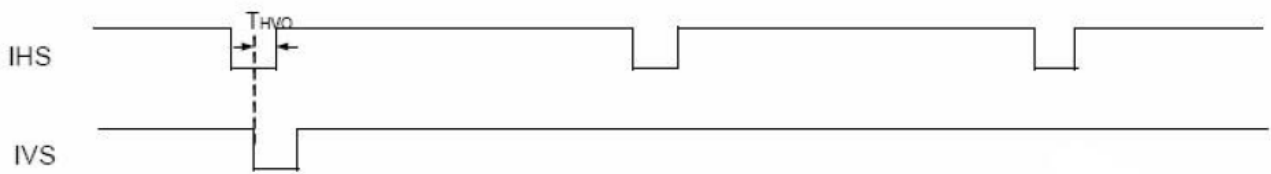
### 7.1 Parallel RGB Interface Timing Characteristics

Hsync and Vsync timing

CCIR601 timing waveform VS\_POL=H, HS\_POL=L in Register R2)

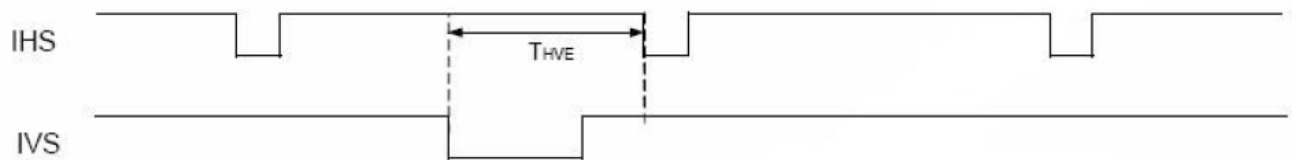
#### IHS and IVS timing

- Odd field



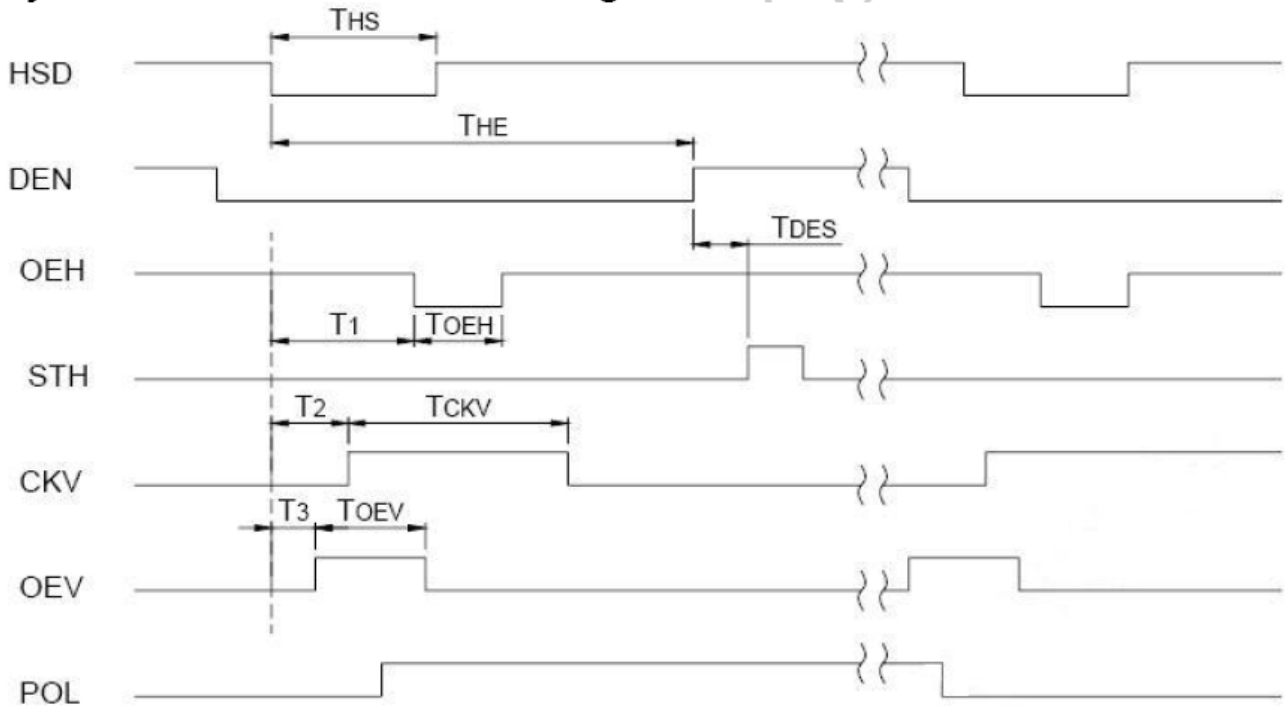
IHS and IVS waveforms in odd field

- Even field



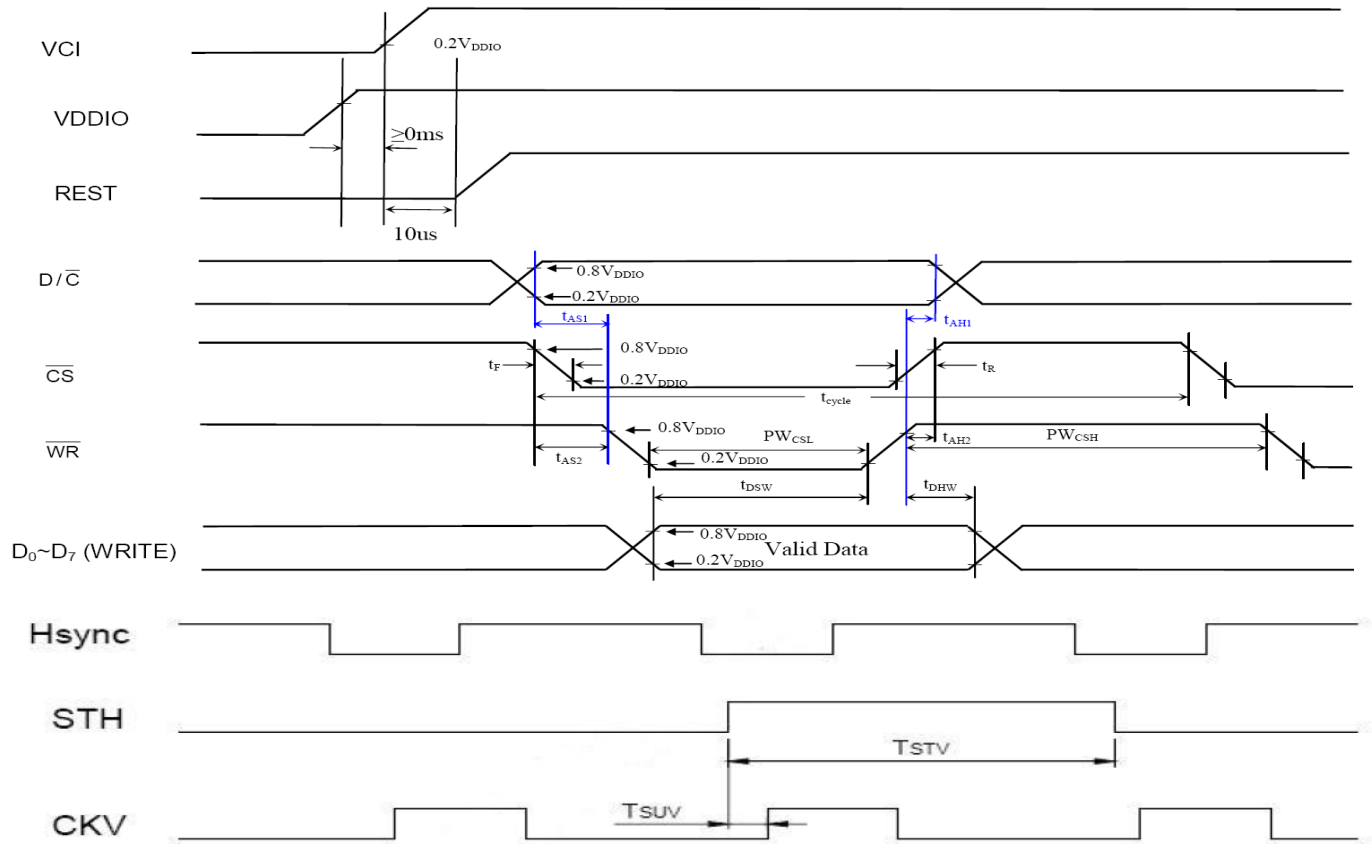
IHS and IVS waveforms in even field

#### Hsync and horizontal control timing waveform

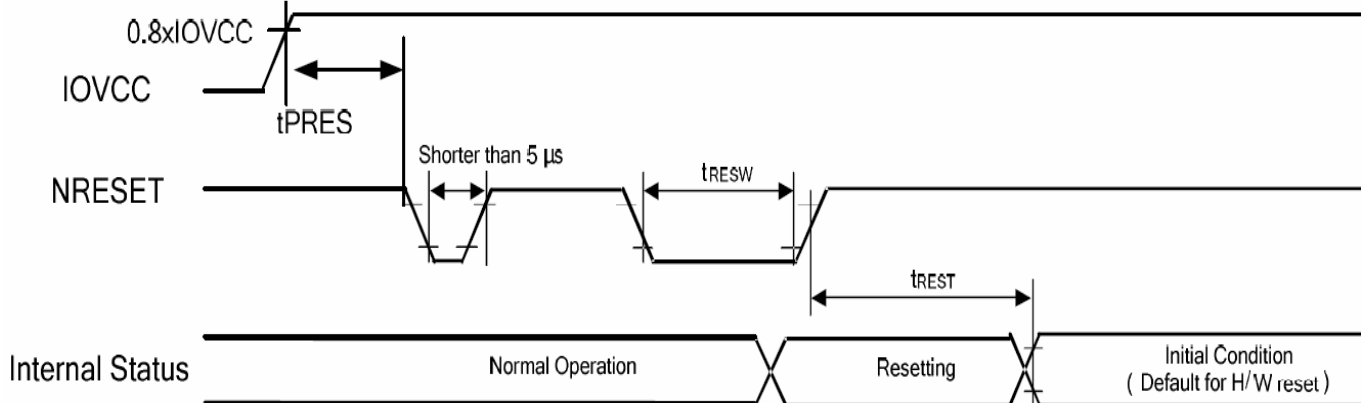




## Hsync and vertical shift clock timing waveform



## 7.2 Reset Timing Characteristics



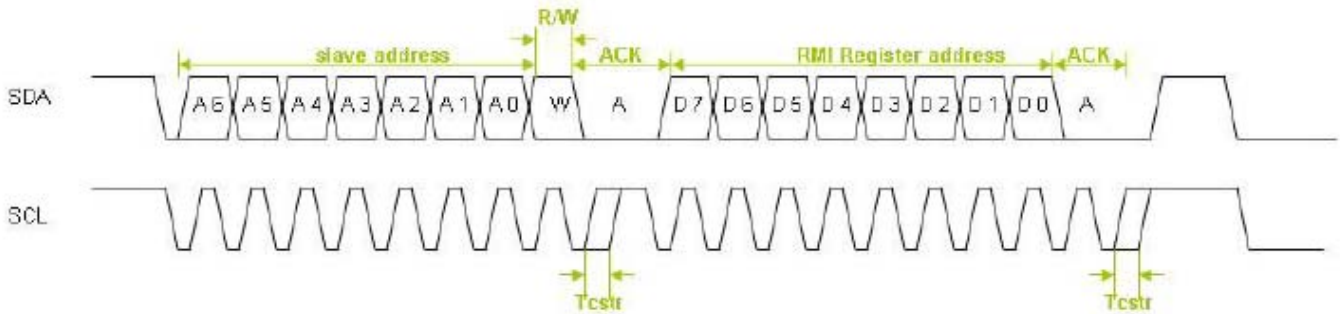
Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width <sup>(1)</sup>	NRESET	10	-	-	-	µs
tREST	Reset complete time <sup>(2)</sup>	-	5	-	-	When reset applied during STB OUT mode	ms
		-	120	-	-	When reset applied during STB mode	ms
tPRES	Reset goes high level after Power on time	NRESET & IOVCC	1	-	-	Reset goes high level after Power on	ms

### 7.3 CTP Timing Characteristics

#### I2C Interfacing

##### Clock stretching

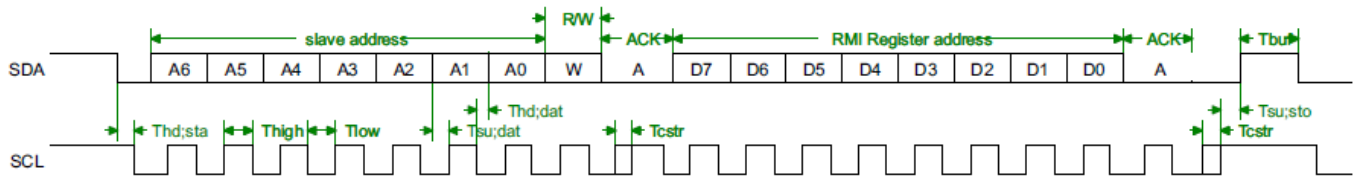
Special attention should be paid to clock stretching when interfacing with a Synaptics Touch Controller over I2C. The host processor must support clock stretching. The first byte of a transaction contains the slave address and read/write bit. At the end of the first byte, the sensor holds SCL low (clock stretches) and checks that the slave address matches its own. If the slave address does not match, the S3103 will not stretch the clock on subsequent byte transmissions until it detects the next start condition. If the slave address does match, the sensor acknowledges and may stretch the clock after some or all of the subsequent bytes within the same transaction (Figure 8).



**Clock stretching within an I2C transaction**

## 7.4 AC electrical characteristics

### I2C

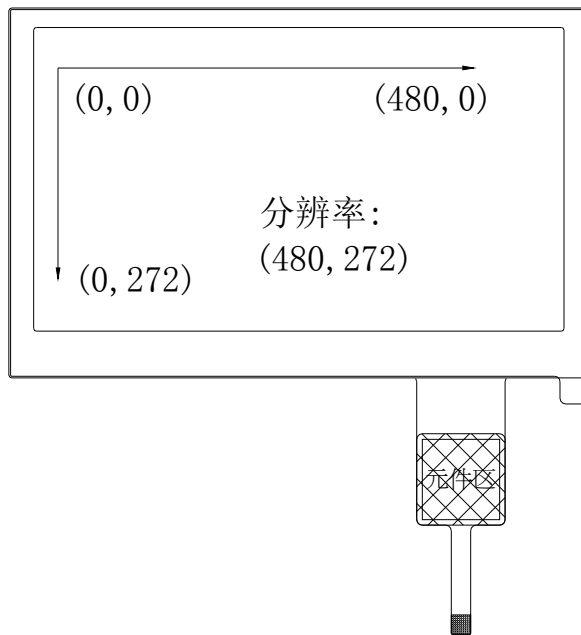


I2C timing

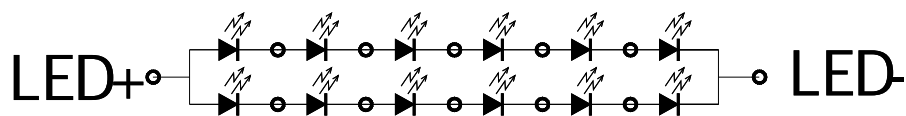
### I2C parameters

Parameter	Symbol	Standard-Mode		Fast-Mode		Unit
		Min.	Max.	Min.	Max.	
SCL clock frequency	$f_{SCL}$	—	100	—	400	kHz
Stretch time	$t_{CSTR}$	—	25	—	25	$\mu s$
Hold time (repeated) START condition. After this period, the first clock pulse is generated.	$t_{HD;STA}$	4.0	—	0.6	—	$\mu s$
LOW period of the SCL clock	$t_{LOW}$	4.7	—	1.3	—	$\mu s$
HIGH period of the SCL clock	$t_{HIGH}$	4.0	—	0.6	—	$\mu s$
Set-up time for a repeated START condition	$t_{SU;STA}$	4.7	—	0.6	—	$\mu s$
Data hold time	$t_{HD;DAT}$	0	3.45	0	0.9	$\mu s$
Data out hold time	$t_{HD;DATO}$	—	0	—	0	$\mu s$
Data set-up time	$t_{SU;DAT}$	250	—	100	—	ns
Rise time of both SDA and SCL signals	$t_r$	—	1000	$20 + 0.1 C_b^{(1)}$	300	ns
Fall time of both SDA and SCL signals	$t_f$	—	300	$20 + 0.1 C_b^{(1)}$	300	ns
Set-up time for STOP condition	$t_{SU;STO}$	4.0	—	0.6	—	$\mu s$
Bus free time between a STOP and START condition	$t_{BUF}$	4.7	—	1.3	—	$\mu s$
Capacitive load for each bus line	$C_b$	—	400	—	400	pF

## 7.5 CTP Block Diagram



## 8. Backlight Characteristic

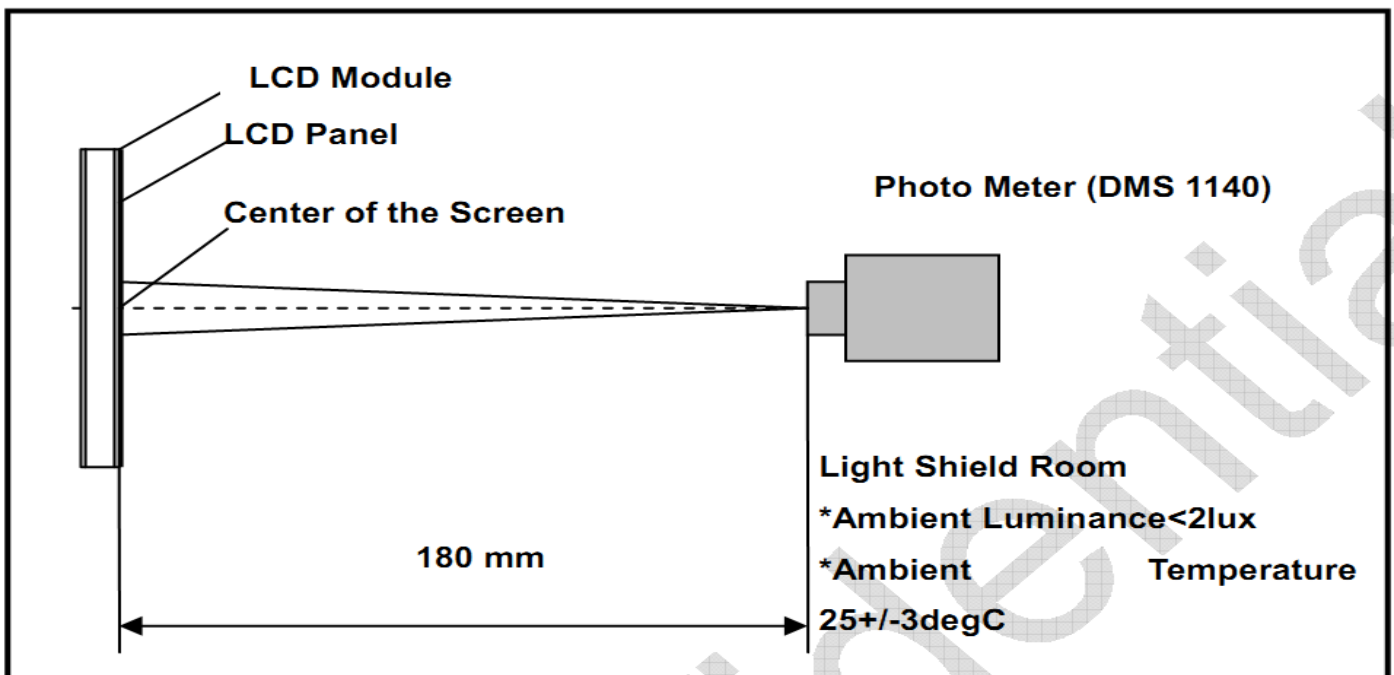


Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	18	19.2	20.4	V	If=40mA
Supply Current	If	-	40	-	mA	-
Luminous Intensity for LCM	-	400	500	-	cd/m <sup>2</sup>	If=40mA
Uniformity for LCM	-	-	80	-	%	If=40mA
Life Time	-	-	50000	-	Hr	If=40mA
Backlight Color	White					

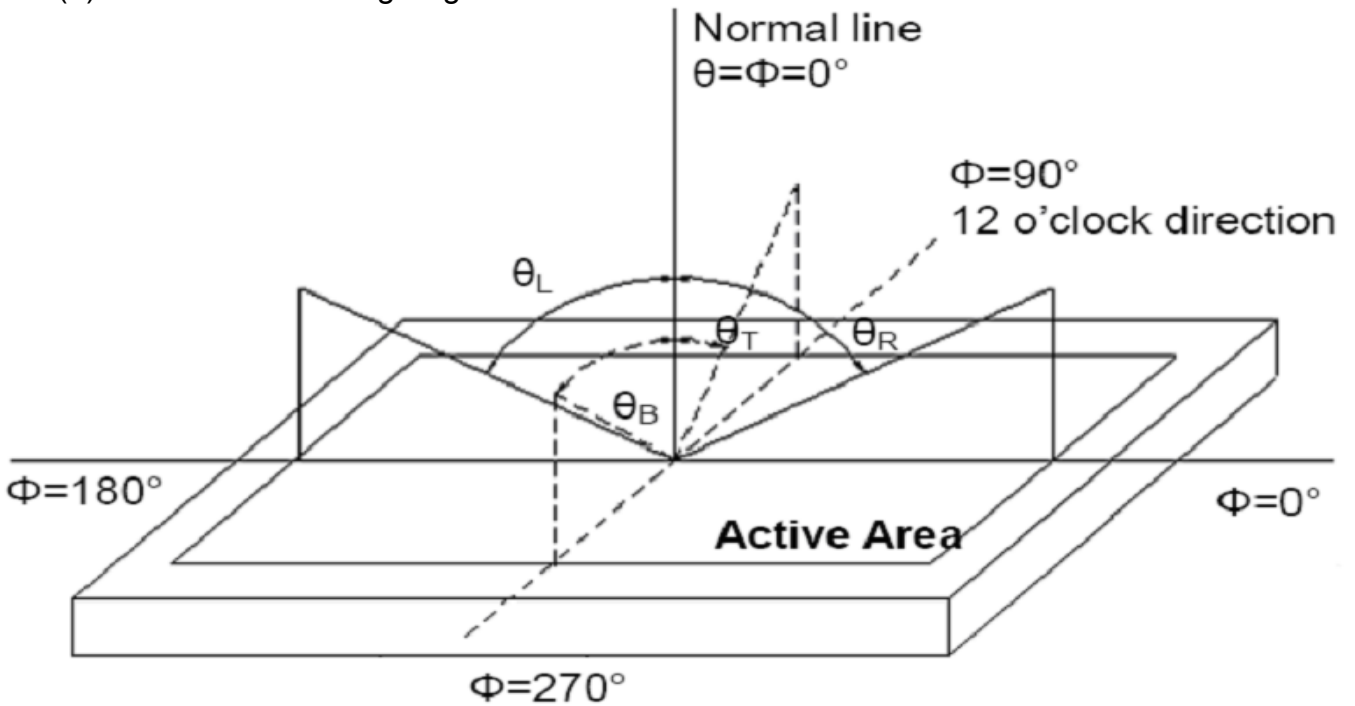
## 9. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	$\theta_L$	45	-	degree	(1),(2),(6)
		$\theta_R$	45	-		
	Vertical	$\theta_T$	15	-		
		$\theta_B$	35	-		
Contrast Ratio	Center	TBD	250	-	-	(1),(3),(6)
Response Time	Rising	-	5	-	ms	(1),(4),(6)
	Falling	-	15	-	ms	
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05	TBD	Typ. +0.05	-	(1), (6)
	Red y		TBD		-	
	Green x		TBD		-	
	Green y		TBD		-	
	Blue x		TBD		-	
	Blue y		TBD		-	
	White x		TBD		-	
	White y		TBD		-	
NTSC	CIE1931	-	55.3	-	%	(1),(6)

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



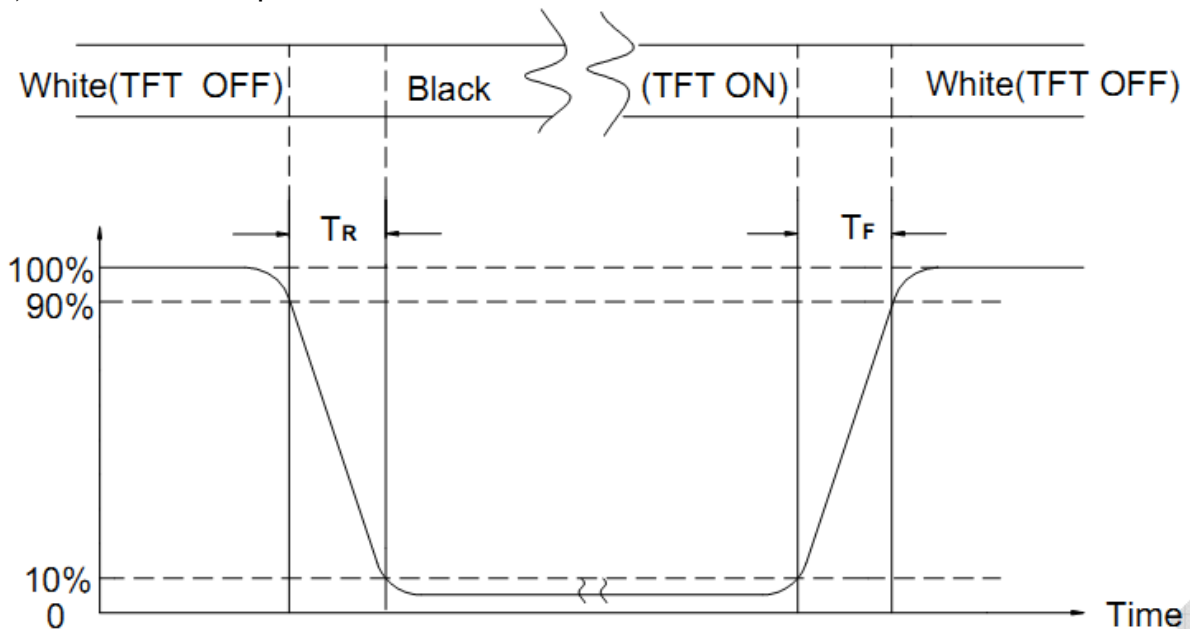
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time



Note (5) Definition of Transmittance (Module is without signal input)

$$\text{Transmittance} = \text{Center Luminance of LCD} / \text{Center Luminance of Back Light} \times 100\%$$

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

## 10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
<input type="checkbox"/>	High Temperature Storage	80°C±2°C×96Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
<input type="checkbox"/>	Low Temperature Storage	-30°C±2°C×96Hours	
<input type="checkbox"/>	High Temperature Operating	70°C±2°C×96Hours	
<input type="checkbox"/>	Low Temperature Operating	-20°C±2°C×96Hours	
<input type="checkbox"/>	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) ← (5min) → (30min) 1cycle Total 10cycle	
<input type="checkbox"/>	Damp Proof Test (Storage)	50°C±5°C×90%RH×120Hours	
<input type="checkbox"/>	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
<input type="checkbox"/>	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
<input type="checkbox"/>	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

### REMARK:

- 1, The Test samples should be applied to only one test item.
- 2, Sample side for each test item is 5~10pcs.
- 3,For Damp Proof Test, Pure water(Resistance > 10MΩ)should be used.
- 4,In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
- 5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
- 6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

**11. Inspection Standard**

11.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

11.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM AMSON TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 °C TO 40°C ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

11.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E ) , LEVEL II SINGLE PLAN.

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %
TOTAL	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

11.1.3. WARRANTY POLICY

AMSON WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. AMSON WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF AMSON.

11.2. CHECKING CONDITION

11.2.1.CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

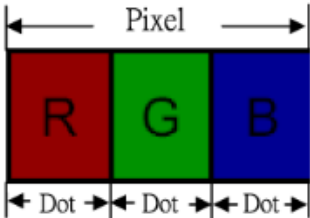
11.2.2.CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

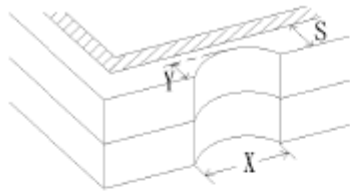
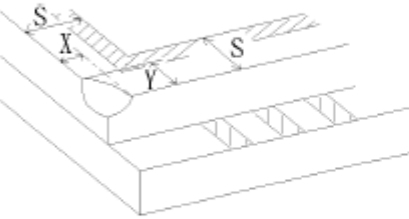
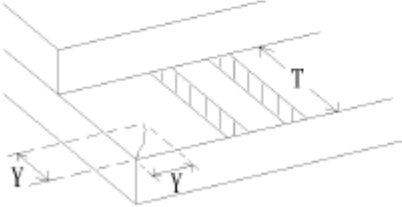
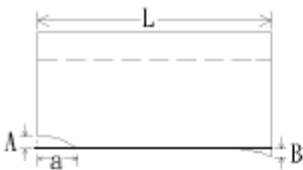
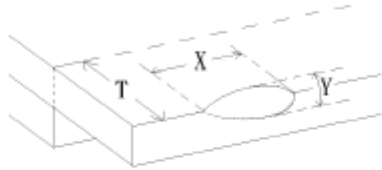
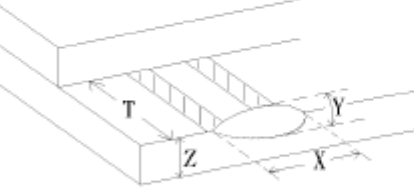
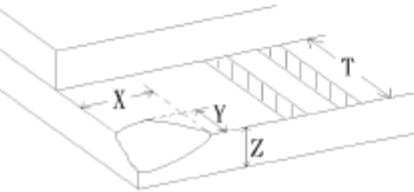


11.3. INSPECTION PLAN :

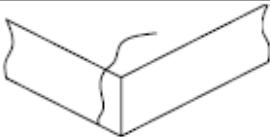
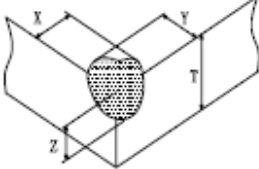
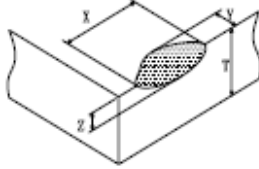
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA .....REJECTED	Minor
	6. BLEMISH · BLACK SPOT · WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH · BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE ( IF NEEDED, AND INSIDE VIEWING AREA )	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS ( CONTRAST· VOP· CHROMATICITY ... ETC )	ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA )	Critical
	11.MISSING LINE	MISSING DOT· LINE · CHARACTER .....REJECTED	Critical
	12.SHORT CIRCUIT· WRONG PATTERN DISPLAY	NO DISPLAY · WRONG PATTERN DISPLAY · CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

**11.4. STANDARD OF VISUAL INSPECTION**

NO.	CLASS	ITEM	JUDGEMENT																				
11.4.1	MINOR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	<p>(A) ROUND TYPE: <span style="float: right;">unit : mm.</span></p> <table border="1"> <thead> <tr> <th>DIAMETER (mm.)</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.25</math></td> <td>3 (Distance&gt;5mm)</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE: <math>\Phi = (\text{LENGTH} + \text{WIDTH}) / 2</math></p> <p>(B) LINEAR TYPE: <span style="float: right;">unit : mm.</span></p> <table border="1"> <thead> <tr> <th>LENGTH</th> <th>WIDTH</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>-----</td> <td><math>W \leq 0.03</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>L \leq 5.0</math></td> <td><math>0.03 &lt; W \leq 0.07</math></td> <td>3 (Distance&gt;5mm)</td> </tr> <tr> <td>-----</td> <td><math>0.07 &lt; W</math></td> <td>FOLLOW ROUND TYPE</td> </tr> </tbody> </table>	DIAMETER (mm.)	ACCEPTABLE Q'TY	$\Phi \leq 0.1$	DISREGARD	$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)	$0.25 < \Phi$	0	LENGTH	WIDTH	ACCEPTABLE Q'TY	-----	$W \leq 0.03$	DISREGARD	$L \leq 5.0$	$0.03 < W \leq 0.07$	3 (Distance>5mm)	-----	$0.07 < W$	FOLLOW ROUND TYPE
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$L \leq 5.0$	$0.03 < W \leq 0.07$	3 (Distance>5mm)																					
-----	$0.07 < W$	FOLLOW ROUND TYPE																					
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	<p style="text-align: right;">unit : mm.</p> <table border="1"> <thead> <tr> <th>DIAMETER</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.2</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.5</math></td> <td>2 (Distance&gt;5mm)</td> </tr> <tr> <td><math>0.5 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>	DIAMETER	ACCEPTABLE Q'TY	$\Phi \leq 0.2$	DISREGARD	$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)	$0.5 < \Phi$	0												
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$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)																						
$0.5 < \Phi$	0																						
11.4.3	MINOR	Dot Defect	<table border="1"> <thead> <tr> <th>Items</th> <th>ACC. Q'TY</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td><math>N \leq 4</math></td> </tr> <tr> <td>Dark dot</td> <td><math>N \leq 4</math></td> </tr> </tbody> </table> <p>Pixel Define :</p>  <p>Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.</p> <p>Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</p> <p>Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</p>	Items	ACC. Q'TY	Bright dot	$N \leq 4$	Dark dot	$N \leq 4$														
Items	ACC. Q'TY																						
Bright dot	$N \leq 4$																						
Dark dot	$N \leq 4$																						

NO.	CLASS	ITEM	JUDGEMENT
11.4.4	MINOR	LCD GLASS CHIPPING	 $Y > S$ Reject
11.4.5	MINOR	LCD GLASS CHIPPING	 $X \text{ or } Y > S$ Reject
11.4.6	MAJOR	LCD GLASS GLASS CRACK	 $Y > (1/2) T$ Reject
11.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 <ol style="list-style-type: none"> <li><math>a &gt; L/3</math>, <math>A &gt; 1.5\text{mm}</math>. Reject</li> <li>B : ACCORDING TO DIMENSION</li> </ol>
11.4.8	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL AREA )	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ Reject
11.4.9	MINOR	LCD GLASS CHIPPING ( ON THE TERMINAL SURFACE )	 $Y > (1/3) T$ Reject
11.4.10	MINOR	LCD GLASS CHIPPING	 $Y > T$ Reject

## 11.5 INSPECTION STANDARD OF TOUCH PANEL

NO.	CLASS	ITEMS		JUDGEMENT		
11.5.1	MAJOR	Touch Panel Crack			Reject	
11.5.2	MINOR	Touch Panel Chipping	Corner		$X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$	Accept
			Edge		$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$	Accept
11.5.3	MINOR	Scratch Dust and Foreign materiel (Linear Type)		$W \leq 0.05, L \leq 20\text{mm}$	Accept	
				$0.05\text{mm} < W \leq 0.07\text{mm}; L \leq 10.0\text{mm}$ Distance between seratch $> 5.0\text{mm}$	Accept 3 ea Max.	
				$W > 0.07\text{mm}$	Reject	
11.5.4	MINOR	Scratch Dust and Foreign materiel (Round Type: $\Phi = (\text{Length} + \text{Width})/2$ )		$\Phi \leq 0.25\text{mm}$	Accept	
				$0.25\text{mm} < \Phi \leq 0.35\text{mm}$ Distance between spots $> 5.0\text{mm}$	Accept 5 ea Max.	
				$\Phi > 0.35\text{mm}$	Reject	
11.5.5	MINOR	Touch Panel Dent / Fish Eyes		$\Phi \leq 0.35\text{mm}$	Accept	
				$0.35\text{mm} < \Phi \leq 1.0\text{mm}$ Distance $> 5.0\text{mm}$	Accept 3 ea Max.	
				$\Phi > 1.0\text{mm}$	Reject	
11.5.6	MINOR	Touch Panel Air Bubble		$\Phi \leq 0.2\text{mm}$	Accept	
				$0.2\text{mm} < \Phi \leq 0.5\text{mm}$ Distance between bubbles $> 5.0\text{mm}$	Accept 3 ea Max.	
				$\Phi > 0.5\text{mm}$	Reject	
11.5.7	MINOR	Touch Panel Printing area Scratch		$W \leq 0.05\text{mm}, L \leq 5\text{mm}$ Distance between scratch $> 5.0\text{mm}$	Accept 3 ea Max.	
				$W > 0.05\text{mm}$ or $L > 5\text{mm}$ ( $W > 0.05$ Follow 11.5.4 Round type )	Reject	
11.5.8	MINOR	Touch Panel White Haze Mark / Dust		Can not be removed	Reject	

## 12. Handling Precautions

### 12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

### 12.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 12.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

### 12.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

### 12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

## 12.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.  
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

## 12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

## 13. Precaution for Use

### 13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

## 14. Packing Method

TBD